

Susceptibility of Sixteen Species of Muscoid Flies to the Microsporidian Parasite *Octospora muscaedomesticae*¹

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Abstract: *Cochliomyia macellaria*, *Phormia regina*, and *Drosophila melanogaster* were highly susceptible to *Octospora muscaedomesticae*. *Hylemya antiqua*, *Phaenicia sericata*, *Musca autumnalis*, and *Muscina stabulans* were slightly susceptible. *Calliphora terraenovae*, *C. vicina*, *C. vomitoria*, *Lucilia illustris*, *Fannia scalaris*, *Haematobia irritans*, *Myospila mediatubunda*, and *Stomoxys calcitrans* were not susceptible. The significance of these findings is discussed.

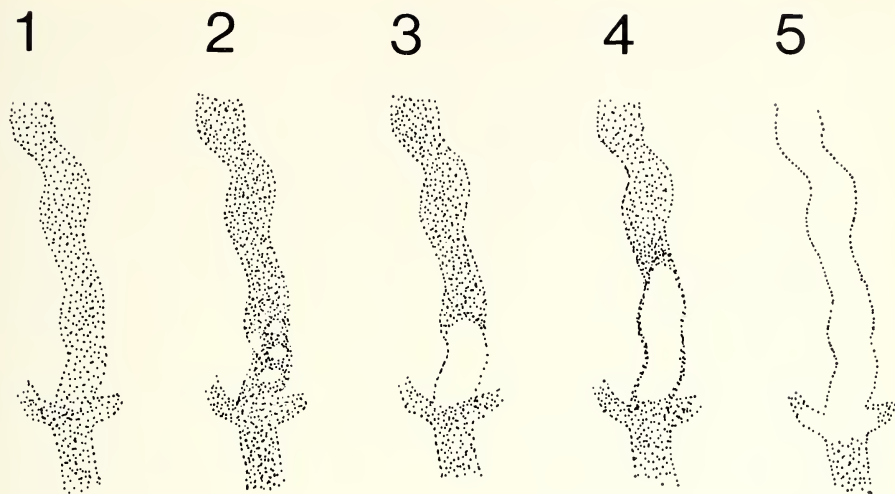
INTRODUCTION

In a previous report concerned primarily with the morphology and tissue specificity of *Octospora muscaedomesticae*, I briefly noted that several species of muscoid flies were susceptible to infection by this microsporidian under laboratory conditions (Kramer, 1964). The present study is an elaboration on these observations with considerations of quantitative as well as qualitative aspects of the problem. The results of this study extend our knowledge of the potential host range of *O. muscaedomesticae* in nature. They also provide us with some insight into the character of host specificity among the dipterophilic microsporidians.

MATERIALS AND METHODS

The flies used in this study were one-day-old adults derived from disease-free laboratory cultures. All flies with the exception of the *Drosophila melanogaster*, *Hylemya antiqua*, and the blood-feeding *Haematobia irritans* and *Stomoxys calcitrans* were fed a 10 percent sucrose solution containing 2×10^8 spores per ml by a method described previously (Kramer, 1964). The *D. melanogaster* were permitted to feed on bits of corn-meal-molasses agar containing spores of the microsporidian. Liquid Diet 116 E.C. prepared by General Biochemicals of Chagrin Falls, Ohio, was used as the vehicle for spore ingestion by the *H. antiqua*. The *H. irritans* and *S. calcitrans* were fed spore-containing defibrinated bovine blood. Flies of all species were held in cages for ten days following a spore-contaminated meal. During this post-inoculation period all flies were provided with an ample supply of appropriate food. The *Octospora muscaedomesticae* spores fed to all sixteen species of flies were taken from the alimen-

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FIGS. 1-5. Diagrammatic depictions of uncoiled proximal intestines of adult muscoid flies. FIG. 1. Normal condition. FIG. 2-5. Intestines infected with *Octosporea muscaedomesticae*. FIG. 2. Scattered infection. FIG. 3. Light infection. FIG. 4. Medium infection. FIG. 5. Heavy infection.

tary tracts of *Phormia regina* reared and infected in the laboratory. On post-inoculation day ten the alimentary tract of each fly was examined for gross lesions. Smears prepared from tracts lacking definite signs of infection were also examined. Both fresh wet mounts and stained smears were studied.

RESULTS AND DISCUSSION

The proximal intestines of many flies remained flexible and translucent and microscopical examinations of tissue fragments revealed no signs of infection or parasite proliferation (see Fig. 1). The changes wrought by the parasite in susceptible flies varied in degree from inapparent to severe. Smears prepared from some intestines that appeared normal on gross inspection revealed minute scattered pockets of infection. In other intestines small but distinct milkwhite spots were found (see Fig. 2). These blemishes contained numerous heavily parasitized cells. In some flies sizable portions of the proximal intestine were milkwhite, distended, rigid, and crammed with the parasite. The extent of derangement and discoloration varied. About one-fourth of the proximal intestine adjacent to the collecting arms of the malpighian tubes was afflicted in some cases (see Fig. 3). In others one-half of this organ was occupied by the parasite (see Fig. 4). In still others the entire proximal intestine was heavily infected (see Fig. 5).

Eight species of flies were susceptible to infection by *Octosporea muscae-*

TABLE 1. The *Octosporea muscaedomesticae* burden in eight species of susceptible muscoid flies on post-inoculation day ten.

Species	Parasite Burden					Percentage Heavily Infected
	Negative	Inapparent	Light ¹	Medium	Heavy	
(Anthomyiidae)						
<i>Hylemya antiqua</i>	16	0	1	2	0	0
(Calliphoridae)						
<i>Cochliomyia macellaria</i>	0	0	0	2	18	90%
<i>Phaenicia sericata</i>	17	1	2	0	0	0
<i>Phormia regina</i>	0	0	0	0	20	100%
(Drosophilidae)						
<i>Drosophila melanogaster</i>	0	0	2	2	16	80%
(Muscidae)						
<i>Musca autumnalis</i>	9	2	0	0	0	0
<i>Muscina stabulans</i>	17	1	0	0	0	0
(Sarcophagidae)						
<i>Sarcophaga bullata</i>	12	3	0	0	0	0

¹ Includes scattered infections.

domesticae. The extent to which the parasite flourished and spread within the proximal intestines of these susceptible hosts was quite variable (see Table 1). Heavy parasite burdens were found in *P. regina*, *C. macellaria*, and *D. melanogaster* with some regularity. While most *H. antiqua*, *P. sericata*, *M. autumnalis*, *M. stabulans*, and *S. bullata* were not infected, a few *H. antiqua* and *P. sericata* did harbor light or medium burdens. Inapparent burdens were found in a few *M. autumnalis*, *M. stabulans*, and *S. bullata*. No sign of infection at any level was found in eight other species of flies (see Table 2).

The foregoing results reveal no sharply defined correlation between susceptibility to infection and the taxonomic affinities or bionomics of the flies considered. Three species of Calliphoridae were susceptible in varying degrees whilst four species belonging to this family were not susceptible at all. While two species of Muscidae were slightly susceptible, four were not. The susceptible species do not share a common life style. As Greenberg and Povolný (1971)

TABLE 2. Species of muscoid flies which were not susceptible to infection by *Octosporea muscaedomesticae*.

(Calliphoridae)	(Muscidae)
<i>Calliphora terraenovae</i> (27)*	<i>Fannia scalaris</i> (12)
<i>C. vicina</i> (16)	<i>Haematobia irritans</i> (31)
<i>C. vomitoria</i> (13)	<i>Myospila meditatunda</i> (9)
<i>Lucilia illustris</i> (11)	<i>Stomoxys calcitrans</i> (28)

* = number of flies examined on post-inoculation day ten.

note, *C. macellaria*, *P. sericata*, *P. regina*, and *S. bullata* are attracted to carrion whilst *D. melanogaster* is generally found on decaying fruit; *M. stabulans* is most often found in association with feces or decaying plant material. *M. autumnalis* frequents cattle droppings and females feed on secretions around the heads of cattle and other mammals (James and Harwood, 1969). *Hylemya antiqua* is found in association with the onion plant almost exclusively (Metcalf et al., 1962). In all probability the factors that separate the susceptible from the nonsusceptible species will be found on the biochemical level, e.g., differences in pH values of intestinal secretions or differences in the activities of gastric enzymes.

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